

# ScreenSpot Resource Discovery for Smart Spaces and MobileVue Media Sharing Application

Marko Jurmu  
MediaTeam Oulu  
Department of Electrical and  
Information Engineering  
Univ. of Oulu, Finland  
marko.jurmu@ee.oulu.fi

Sebastian Boring  
Media Informatics Group  
Department of Computer  
Science, University of  
Munich, Germany  
sebastian.boring@ifi.lmu.de

Jukka Riekkii  
Intelligent Systems Group  
Department of Electrical and  
Information Engineering  
Univ. of Oulu, Finland  
jukka.riekki@ee.oulu.fi

## ABSTRACT

This paper documents the demonstration showcasing the *ScreenSpot* resource discovery framework and the *MobileVue* social media sharing application. The key points of the demonstration include: requesting multidimensional resource availability information from a smart space and visualizing this information to the user on a personal device, leasing the selected resource for a distributed application launch and utilizing the leased resource to deploy an application for personal media viewing, manipulating and sharing. This application then allows users a 3D sensor-based interaction between their mobile phone and a large public display.

## Categories and Subject Descriptors

C.2.4 [Computer-Communication Networks]: Distributed Systems

I.3.6 [Computer Graphics]: Methodology and Techniques

## Keywords

Ubiquitous computing, resource leasing, mobile phones, 3D sensor input, media sharing.

## 1. MOTIVATION & RELATED WORK

For several years, digital media succeeds in our everyday life. Through the introduction of smart handheld devices with media capturing capabilities and sufficient storages, people start to have ultra-portable media storages with them. Naturally, as an emergence of this development, the need for media organizing, manipulation and sharing has increased.

The portability of these handhelds highly constraints the

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user interfaces they can support. In the case of media the screen size is of great importance, but also the keyboard is limited when considering email for example. For this purpose, multiple research efforts have studied the themes of UI migration and multi-modal interaction [1][2][3].

Several terms have emerged for describing the surroundings that support these interactions, such as *smart spaces*, *instrumented environments* or *ambient intelligence*. Similarly, several different architectures have been designed for the technological support of this extension process. In many cases, the architectures have adopted a service-oriented approach, modeling the extensions through commonly agreed service interfaces and allowing clients to discover and connect to these interfaces.

The actual resource allocations of the services, however, are mostly considered trivial and left for the OS layer. We argue that this should not be the case, especially concerning resources that actively participate in distributed used interfaces. Therefore we promote the middleware support for discovering and reserving these ambient resources.

Regarding the viewing of digital media on large displays, research has been conducted in the past [4]. Mostly, these systems address either single user interfaces [5] or rely on direct touch technologies [6]. As direct touch interfaces are often hard to find in public settings, several projects also deal with remote control of large secondary displays. In this field, most of the observed systems rely on 2D input such as the mobile phone's joystick [7]. According to Balagas et al. [8] however, 3D input-based interaction with remote displays has not been widely examined in the HCI area.

## 2. DEMO DESCRIPTION

The demonstration is aimed to fully cover an exemplary launch of a distributed application structure in a service-oriented smart space, where the application deals with personal media management. The advantage of the distribution in this setting is in utilizing a large situated display for facilitated media rendering purposes.

## 2.1 ScreenSpot

The scenario starts with the mobile user wishing to view and share her pictures. She decides to use the *MobileVue* application, which requires a situated display. So the first task is to discover any displays from the current smart space, along with their associated availabilities and capabilities. As a result of the discovery, the current status of the discovered displays is shown with an integrated view in order to facilitate the selection process.

When a suitable target display is selected, it is reserved by requesting a context-aware lease to it. The request is checked against the service support and the ACL of the target display, and if successful, the lease is granted for the user. The next phase is for the user to proceed (with some guidance) to the reserved target display, and authenticate through suitable local connectivity. This can be either an RFID touch or a Bluetooth connection. After the user is successfully authenticated against the lease stored to the target display, the application session can be launched.

## 2.2 MobileVue

Once the application session has been launched, the mobile phone presents a list for selecting images to be transferred to the public display. After selecting a set of images, *MobileVue* transfers those onto the public screen's viewing canvas and the user is able to start interacting with them.



**Figure 1.** Two persons using the *MobileVue* application.

The visual feedback is distributed on two displays for each user. While the public display shows the same view for every user, personalized information is shown on the mobile phone's screen. In the case of *MobileVue* the user interface contains a tool palette for manipulating the images on the screen (see Figure 1).

Using the mobile phone's built-in sensors, users are then able to apply the selected tool shown in their personal tool palette to the image that is beneath the user's cursor on the public screen. Hence, the phone acts a 3D mouse where the joystick's "select" button acts as the mouse button. The speed of interaction is determined by the tilting angle of the phone.

## 3. FUTURE WORK

This research entails multiple future directions. These can be divided between those aimed for the technical support for the resource leasing, and to those concerning the multi-display interaction and 3D input.

In the resource leasing, challenges are in semantic representations of services, in the injection and extraction of state information in the case of stateful distributed services and in the seamless co-operation between the different users and user groups of the ambient resources.

Regarding the interaction, the separation of UIs (public vs. personal screens) can be used in a variety of applications. In addition, the 3D input seems to be a good technique and should be formally evaluated against standard key-based input. *MobileVue* encompasses only basic image manipulation techniques, but will be extended towards more interaction possibilities in the near future.

## 4. ACKNOWLEDGMENTS

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